N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

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Research Design

Contributors
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Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

Causality
A \rightarrow B
Pressure \rightarrow Ulcer

Multicausality
Years smoking \rightarrow Heart disease
High fat diet \rightarrow Heart disease
Limited exercise \rightarrow Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

- Measure of accuracy of a study

- Examined with critique of the following dimensions:
  - Statistical conclusion validity
  - Internal validity
  - Construct validity
  - External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

- Levels of controlling:
  - Natural setting
  - Partially controlled setting: e.g., clinics
  - Highly controlled setting: e.g., laboratory
• Controlling the equivalence of subjects and groups
  ○ Random subject selection
  ○ Random assignment to groups
• Controlling the treatment

  o Choose a treatment based on research and practice
  o Develop a protocol for implementation
  o Document the implemented treatment
  o Use a check-list to determine the extent of completeness to which the treatment was implemented
  o Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?
- No
  - Is the primary purpose examination of relationships?
    - No
      - Descriptive Design
    - Yes
      - Will the sample be studied as a single group?
        - No
          - Correlational Design
        - Yes
          - Quasi-Experimental Study

- Yes
  - Is the treatment tightly controlled by the researcher?
    - No
      - Quasi-Experimental Study
    - Yes
      - Will a randomly assigned control group be used?
        - No
          - Is the original sample randomly selected?
            - Yes
              - Experimental Study
            - No
              - Quasi-Experimental Study
        - Yes
          - Experimental Study
Selecting a Descriptive Design

Examine sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Data collected across time
        - No
          - Cross-sectional design
        - Yes
          - Studying events partitioned across time?
            - No
              - Trend Analysis
            - Yes
              - Repeated measures of each subject

- Yes
  - Single unit of study
    - No
      - Longitudinal Study
    - Yes
      - Case Study

Research Design

Cross-sectional design with treatment partitioning

Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification → Measurement → Description → Interpretation

Phenomenon of Interest

Variable 1

Variable 2

Variable 3

Variable 4

Description of Variable 1

Description of Variable 2

Description of Variable 3

Description of Variable 4

Interpretation of Meaning

Development of Hypotheses

Research Design 16
A Comparative Descriptive Design

Group I {
variables measured}

Describe

Comparison of Groups on Selected Variables

Interpretation of Meaning

Group II {
variables measured}

Describe

Development of Hypotheses
Selecting the Type of Correlational Design

Describe relationships between/among variables?
- Descriptive correlational design

Predict relationships between/among variables?
- Predictive correlational design

Test theoretically proposed Relationships?
- Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Research Variable 2

Description of variable

Interpretation of Meaning

Development of Hypotheses
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Control Group?
- No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Repeated Measures?
        - No
          - Strategy for Comparison
        - Yes
          - Repeated Measures?
            - No
              - Suggest Reevaluating design
            - Yes
              - Compare treatment & control conditions?

Selecting The Type of Experimental Design

- Pretest
  - No: Post-test only control group design
  - Yes: Repeated Measurements?
    - No: Examine effects of confounding variables?
      - No: Multiple sites?
        - No: Pretest/post-test control group design
        - Yes: Randomized clinical trials
          - No: Comparison of multiple levels of treatment
            - No: Examination of complex relationships among variables in relation to treatment
            - Yes: Nested Designs
          - Yes: Randomized Block Design
## Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th></th>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
<td>POST-TEST</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td>POST-TEST</td>
<td></td>
</tr>
</tbody>
</table>

### Treatment:
Under control of researcher

### Findings:
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

### Example:
Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

### Uncontrolled threats to validity:
- Instrumentation
- Restricted generalizability as control increases

### Mortality
# Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
<th>TREATMENT</th>
<th>POST-TEST</th>
<th>POST-TEST</th>
</tr>
</thead>
</table>

| Measurement of independent variables | Measurement of dependent variables |

**Treatment:** Under control of researcher

**Findings:** Comparison of experimental and control groups


**Uncontrolled threats to validity:** Instrumentation, Mortality, Limited generalizability as control increases
### Nested Design

#### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>Unit A</th>
<th>Unit B</th>
<th>Unit C</th>
<th>Unit D</th>
<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRN Medication</td>
<td></td>
<td></td>
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<tr>
<td>New approach: “Around the clock” medication</td>
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<th>Unit E</th>
<th>Unit F</th>
<th>Unit G</th>
<th>Unit H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Nursing Care</td>
<td>Primary Care</td>
<td>No Primary Care</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Research Design
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically

- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design